

**REMARKS**

This is in response to the Office Action mailed on June 19, 2009, in which claim 11 was objected to, claim 16 was rejected under 35 U.S.C. § 112; and the following rejections were made under 35 U.S.C. § 103(a):

1. Claims 1-3, 8, 10, 11, 16, 18, 19, 21, 22, 27, 28, 33, 43-45, and 47-49 were rejected as being obvious over the specification of the present application (pages 1-4 and 8) as exemplified in part by Crump, U.S. Patent No. 5,121,329 ("Crump") in view of Joseph et al., U.S. Patent No. 3,807,054 ("Joseph") or Edmonds, U.S. Patent No. 5,448,838 ("Edmonds");
2. Claims 4, 5, 23, and 46 rejected as being obvious over the specification of the present application as exemplified in part by Crump in view of Joseph/Edmonds and further in view of Dahlin et al., U.S. Patent No. 6,022,207 ("Dahlin");
3. Claim 20 was rejected as being obvious over the specification of the present application as exemplified in part by Crump in view of Joseph/Edmonds and further in view of Leyden et al., U.S. Patent No. 5,143,663 ("Leyden"); and
4. Claims 18 and 48 were rejected as being obvious over the specification of the present application as exemplified in part by Crump in view of Joseph/Edmonds and further in view of Gessner, U.S. Patent No. 4,983,223 ("Gessner").

With this response, the specification is amended, claims 1, 16, 21, 43, and 44 are amended, and claim 2 is canceled, such that pending claims 1, 3-5, 8, 10, 11, 16, 18-23, 27, 28, 33, and 43-49 are presented for reconsideration and allowance.

I. Examiner Interview Summary

A telephone Examiner Interview was conducted on October 13, 2009 between Examiner John L. Goff and Brian R. Morrison (attorney for Applicants). Applicants initially wish to express their gratitude to Examiner Goff for taking time to discuss the case. During the Examiner Interview, the participants discussed the Office Action rejections, proposed

amendments to the claims and specification, and test results in support of Applicants' assertion of inherency under M.P.E.P. § 2163.07.

II. Response to Objection of Claim 11

The Office Action indicated that claim 11 was objected to under 37 C.F.R. § 1.75(c) for failing to further limit the subject matter of a previous claim. Applicants respectfully disagree with this contention. Claim 11 depends from claim 1, where claim 1 recites *providing* an object built from a polymeric or wax modeling material using a fused deposition modeling technique. Claim 11 further requires the active step of *building* the object using the fused deposition modeling technique. As such, claim 11 does further limit the subject matter of claim 1, and Applicants respectfully request withdrawal of this objection.

III. Response to Rejection under 35 U.S.C. § 112

The Office Action also indicated that claim 16 was rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement. In particular, the Office Action stated that "re-exposing the object" is unclear. While Applicants respectfully disagree with the contention discussed in the Office Action, with this response, claim 16 is amended to remove the element of "re-exposing the object...". In view of this amendment, Applicants respectfully request withdrawal of this rejection.

IV. Inherent Features

With this response, the specification and independent claims 1, 21, and 43 are amended to recite that the object exhibits porosity due to the fused deposition modeling technique and that the steps of exposing the object to vapors of a solvent and reflowing the softened modeling material also reduce the porosity of the object at the object surface. Dependent claims 16 and 44 are also amended to recite eliminating the porosity of the object at the object surface. Applicants assert that these amendments do not include prohibited new matter because the amendments include features that are inherent to the claim invention pursuant to M.P.E.P. § 2163.07.

Section 2163.07 states that a patent application may be amended to recite an inherent function, theory, or advantage without introducing prohibited new matter. Inherency may be established with extrinsic evidence that makes clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. M.P.E.P. § 2163.07. Inherency, however, may not be established by probabilities or possibilities, and the mere fact that a certain thing may result from a given set of circumstances is not sufficient.

Enclosed with this response is a Declaration of Robert L. Zinniel (“Zinniel Declaration” in support of Applicants’ assertion that the amended subject matter is inherent to the claimed invention pursuant to M.P.E.P. § 2163.07. In particular, the Zinniel Declaration discloses a porosity test performed on three-dimensional (3D) objects built with a fused deposition modeling system to show that (1) 3D objects built with a fused deposition modeling system are necessarily porous due to the build technique, and (2) the vapor smoothing process taught in present application necessarily reduces or eliminates surface porosities of the 3D objects (see e.g., Zinniel Decl. ¶ 2).

Details of the porosity test in support of inherency are shown in paragraphs 3, 4, and 6-11 of the Zinniel Declaration. Furthermore, Image 5 in Appendix A-4 of the Zinniel Declaration shows that 3D objects built with a fused deposition modeling system are necessarily porous due to the build technique (Zinniel Decl. ¶ 9 and 10), and Image 6 in Appendix A-4 of the Zinniel Declaration shows that the vapor smoothing process taught in present application necessarily reduces or eliminates surface porosities of the 3D objects (Zinniel Decl. ¶ 11). This sealing effect would be recognized by people skilled in the art of rapid prototyping/manufacturing processes based on the teachings of the present application (Zinniel Decl. ¶ 11). Accordingly, in view of this extrinsic evidence, Applicants assert that the amendments to the specification are inherent features pursuant to M.P.E.P. § 2163.07, and no new matter has been introduced. Furthermore, Applicants assert that the amendments to claims 1, 16, 21, 43, and 44 are fully supported by the specification including the amendments of the inherent features.

V. Response to Obviousness Rejections

The Office Action also indicated that claims 1-5, 8, 10, 11, 16, 18-23, 27, 28, 33, 43-49 were rejected under 35 U.S.C. § 103(a) in view of the specification of the present application (pages 1-4 and 8) as exemplified in part by Crump in view of Joseph/Edmonds, Dahlin, Leyden, and/or Gessner. As discussed above, with this response, the specification and independent claims 1, 21, and 43 are amended to recite that the object exhibits porosity due to the fused deposition modeling technique and that the steps of exposing the object to vapors of a solvent and reflowing the softened modeling material also reduce the porosity of the object at the object surface. Applicants assert that the cited references, taken alone or in combination, do not teach or render obvious this reduction in surface porosity that is attainable with the methods recited in claims 1, 21, and 43.

As stated in the Zinniel Declaration, and in the Declaration of Francisco Medina submitted with the Supplemental Amendment of March 27, 2009 (“Medina Declaration”) (copy enclosed), the porous regions are inherent in 3D object built with a fused deposition modeling layered technique due to the build technique (see e.g., Zinniel Decl. ¶ 10). The pores are created to provide a cushion in the build parameters when depositing the modeling material to maintain the dimensional accuracy of the 3D object, as discussed in U.S. Patent No. 5,653,925 (Zinniel Decl. ¶ 10). The claimed method of exposing the object to solvent vapors that transiently soften the modeling material at the object surface and reflowing the softened modeling material also reduces the porosity of the 3D object at the object surface (Zinniel Decl. ¶ 2, and Medina Decl. ¶ 2). This reduced porosity potentially seals the exposed area, which may create water-tight three-dimensional objects that can withstand pressure buildup (Zinniel Decl. ¶ 11, and Medina Decl. ¶ 2).

In comparison, conventional smoothing techniques, such as trimming, machining, grinding, and sanding, may not necessarily reduce porosity since these techniques do not reflow the modeling material. The Zinniel Declaration also includes test results of a comparative porosity test performed on one of the 3D models after the given 3D model was hand sanded (Zinniel Decl. ¶ 5 and 12). Image 3 in Appendix A-2 of the Zinniel Declaration shows that hand sanding may provide a smooth exterior surface (Zinniel Decl. ¶ 5). However, as shown in Image 7 in Appendix A-5 of the Zinniel Declaration, after hand

sanding, the surface porosity of the resulting 3D model retained its porosity (Zinniel Decl. ¶ 12).

Furthermore, the plastic articles that are smoothed pursuant to Joseph and Edmonds are typically built from an injection molding or similar technique, and do not exhibit such porosity issues. Thus, the plastic articles do not exhibit any reduction in surface porosity. In comparison, as shown in Image 2 in Appendix A-2 and Image 6 in Appendix A-6 of the Zinniel Declaration, exposing the object built using a fused deposition modeling technique to vapors of a solvent that transiently softens the modeling material at the object surface, and reflowing the softened modeling material (1) smoothes the object surface and (2) reduces the porosity of the object at the object surface (Zinniel Decl. ¶ 4 and 11). This combination of exposing the object to solvent vapors/reflowing the softened modeling material with the use of a 3D object built with a fused deposition modeling technique provides porosity-reduction characteristics that are not present in, nor recognized by, the teachings of the cited references.

Additionally, Applicants also assert that Crump, Joseph, and Edmonds, taken alone or in combination, do not disclose or suggest that surface effects due to the fused deposition modeling technique used may be reduced by exposing the object to solvent vapors that transiently soften the modeling material at the object surface, and reflowing the softened modeling material.

The Office Action stated that the Medina Declaration was not previously persuasive to overcome the obviousness rejections in view of Crump, Joseph, and Edmonds because the claims were not commensurate in scope with the arguments (i.e., the claims did not require sealing the exposed area with vapor exposures), and that there were no quantitative results to demonstrate the sealing (Office Action, page 11). In response, claims 1, 21, and 43 are amended to recite that the object exhibits porosity due to the fused deposition modeling technique and that the steps of exposing the object to vapors of a solvent and reflowing the softened modeling material also reduce the porosity of the object at the object surface. Moreover, the Zinniel Declaration shows the reduction in porosity attainable with the claimed method.

Accordingly, for the reasons discussed in the Supplemental Amendment of March 27, 2009, and because the cited references, taken alone or in combination, do not teach or render obvious the reduction in surface porosity that is attainable with the claimed invention, independent claims 1, 21, and 43 are not obvious over the specification of the present application (pages 1-4 and 8) as exemplified in part by Crump in view of Joseph and/or Edmonds, and are allowable. Additionally, dependent claims 3, 8, 10, 11, 16, 18, 19, 22, 27, 28, 33, 44, 45, and 47-49, which depend from claims 1, 21, and 43 are also not obvious over the specification of the present application (pages 1-4 and 8) as exemplified in part by Crump in view of Joseph and/or Edmonds, and are separately allowable.

Moreover, Dahlin, Leyden, and Gessner also do not teach or render obvious the reduction in surface porosity that is attainable with the claimed invention. As such, independent claims 1, 21, and 43, and dependent claims 4, 5, 18, 20, 23, 46, and 48, which depend from claims 1, 21, and 43, are not obvious over the specification of the present application (pages 1-4 and 8) as exemplified in part by Crump in view of Joseph/Edmonds, Dahlin, Leyden, and/or Gessner, and are allowable.

### **CONCLUSION**

It is submitted that independent claims 1, 21, and 43 are in form for allowance. It is also submitted that the dependent claims 3-5, 8, 10, 11, 16, 18-20, 22, 23, 27, 28, 33, and 44-49 are in form for allowance as well due to their dependent nature. Reconsideration and allowance of pending claims 1, 3-5, 8, 10, 11, 16, 18-23, 27, 28, 33, and 43-49 are respectfully submitted.

The foregoing remarks are intended to assist the Office in examining the application and in the course of explanation may employ shortened or more specific or variant descriptions of some of the claim language. Such descriptions are not intended to limit the scope of the claims; the actual claim language should be considered in each case. Furthermore, the remarks are not to be considered exhaustive of the facets of the invention which are rendered patentable, being only examples of certain advantageous features and differences, which Applicants' attorney chooses to mention at this time. For the foregoing reasons, Applicants reserve the right to submit additional evidence showing the distinction

between Applicants' invention to be novel and non-obvious in view of the prior art.

Furthermore, in commenting on the references and in order to facilitate a better understanding of the differences that are expressed in the claims, certain details of distinction between the same and the present invention have been mentioned, even though such differences do not appear in all of the claims. It is not intended by mentioning any such unclaimed distinctions to create any implied limitations in the claims.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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